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Docket No.: 08228/061001
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Letters Patent of:
Hisao Sato et al.

Patent No.: 7,372,066

Issued: May 13, 2008

For: GALLIUM NITRIDE COMPOUND SEMICONDUCTOR DEVICE AND MANUFACTURING METHOD

REQUEST FOR CERTIFICATE OF CORRECTION
PURSUANT TO 37 CFR 1.322

Attention: Certificate of Correction Branch
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Upon reviewing the above-identified patent, Patentee noted typographical errors which should be corrected.

In the Claims:

In Claim 3, column 16, line 9, "The" should be --**the**--.

In Claim 3, column 16, line 13, "The" should be --**the**--.

In Claim 4, column 16, line 28, "0.5 mu" should be --**0.5 nm**--.

In Claim 5, column 16, line 36, "1 mm" should be --1**nm**--.

The errors were not in the application as filed by applicant; accordingly no fee is required.

Transmitted herewith is a proposed Certificate of Correction effecting such amendment. Also enclosed, as evidence of the error, is a copy of the claims as issued and a copy of the Amendments to the Claims. Patentee respectfully solicits the granting of the requested Certificate of Correction.

Applicant believes no fee is due with this request. However, if a fee is due, please charge our Deposit Account No. 50-0591, under Order No. 08228/061001.

Dated: June 5, 2008

Respectfully submitted,

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A device was manufactured in which a lamp of a commercially available insect extermination device was changed to the LED. 200 LEDs of a wavelength of 372 nm were used and driven by a pulse similar to the above-described experiment. As a result, it was possible to exterminate approximately the same number of insects in one night compared to the original device. The insect extermination device in which the LED of the present embodiment is used as the light source has advantages that the power consumption is low and the degree of freedom for layout of the light source is increased because the LED is small. In addition, because the light is almost invisible to the naked eye, it is possible to use this device in an environment in which illumination is not desired.

Preferred embodiments of the present invention have been described. These preferred embodiments, however, are only exemplary, and other devices may be created using the LED of the present invention. For example, the present invention can be applied to a device for judging paper currency or testing for forgery of paper currency, or for cleaning air or water using a photocatalytic effect obtained by irradiating light on titanium oxide.

In the embodiments, it is possible to use an AlGaN layer in place of the GaN layer **16** and to use an n-type AlGaN layer in place of the n-type GaN layer **18**. Moreover, in the embodiments, it is possible to use an InGaN layer in place of the GaN layer **22** and ap-type InGaN layer in place of the p-type GaN layer **28**. The GaN-based layer includes, in addition to the GaN layer, An AlGaN layer and an InGaN layer in which the Ga in GaN is replaced by Al or In.

The invention claimed is:

1. A gallium nitride-based compound semiconductor device comprising:

a substrate;

a first superlattice layer which is formed above the substrate and in which an n-type AlGaN layer and an n-type GaN layer are alternately layered;

a multiple quantum well layer which is formed above the first superlattice layer and in which a GaN-based quantum well layer and a GaN-based quantum barrier layer are alternately layered;

a second superlattice layer which is formed above the multiple quantum well layer and in which a p-type AlGaN layer and a p-type GaN layer are alternately layered;

a buffer layer, a first GaN-based layer which is formed above the buffer layer, and an n-type GaN-based layer which is formed above the first GaN-based layer are provided between the substrate and the first superlattice layer;

a second GaN-based layer is provided between the first superlattice layer and the multiple quantum well layer; and

a p-type GaN layer is provided above the second superlattice layer;

wherein the first GaN-based layer has a structure in which an SiN layer is inserted in a GaN layer, and

the second GaN-based layer has an AlGaN layer.

2. A gallium nitride-based compound semiconductor device according to claim **1**, wherein

a compositional ratio of Al in the GaN-based quantum barrier layer in the multiple quantum well layer is larger than compositional ratios of Al in the first superlattice layer and the second superlattice layer.

3. A gallium nitride-based compound semiconductor device according to claim **1**, wherein

each of compositional ratios of Al in the AlGaN layers in the first superlattice layer and in the second superlattice layer is 5% or greater and 25% or smaller;

a compositional ratio of In in the InGaN quantum well layer or the AlInGaN quantum well layer in the multiple quantum well layer is 3% or greater and 20% or smaller;

a compositional ratio of Al in the AlGaN quantum barrier layer or the AlInGaN quantum barrier layer in The multiple quantum well layer is 1% or greater and 30% or smaller; and

a band gap of the quantum well layer is smaller than a band gap of The quantum barrier layer.

4. A gallium nitride-based compound semiconductor device according to claim **1**, wherein

each of thicknesses of the AlGaN layer and the GaN layer in the first superlattice layer is 1 nm or greater and 10 nm or smaller;

a thickness of the quantum well layer in the multiple quantum well layer is 1 nm or greater and 5 nm or smaller;

a thickness of the quantum barrier layer in the multiple quantum well layer is 2 nm or greater and 50 nm or smaller;

a thickness of the AlGaN layer in the second superlattice layer is 0.5 nm or greater and 10 nm or smaller; and

a thickness of the GaN layer in the second super lattice layer is 0.5 mu or greater and 5 nm or smaller.

5. A gallium nitride-based compound semiconductor device according to claim **1**, wherein

a thickness of the first GaN-based layer is 500 nm or greater and 3000 nm or smaller;

a thickness of the n-type GaN-based layer is 500 nm or greater and 10000 nm or smaller;

each of thicknesses of the AlGaN layer and the GaN layer in the first superlattice layer is 1 mm or greater and 10 nm or smaller;

a thickness of the second GaN-based layer is 5 nm or greater and 100 nm or smaller;

a thickness of the quantum well layer in the multiple quantum well layer is 1 nm or greater and 5 nm or smaller;

a thickness of the quantum barrier layer in the multiple quantum well layer is 2 nm or greater and 50 nm or smaller;

a thickness of the AlGaN layer in the second superlattice layer is 0.5 nm or greater and 10 nm or smaller;

a thickness of the GaN layer in the second superlattice layer is 0.5 nm or greater and 5 nm or smaller; and

a thickness of the p-type GaN-based layer is 5 nm or greater and 50 nm or smaller.

6. A gallium nitride-based compound semiconductor device according to claim **1**, wherein

each of thicknesses of the AlGaN layer and the GaN layer in the first superlattice layer is 1.5 nm or greater and 5 nm or smaller;

a thickness of the quantum well layer in the multiple quantum well layer is 1 nm or greater and 2 nm or smaller;

a thickness of the quantum barrier layer in the multiple quantum well layer is 6 nm or greater and 20 nm or smaller;

a thickness of the AlGaN layer in the second superlattice layer is 1 nm or greater and 6 nm or smaller, and

a thickness of the GaN layer in the second superlattice layer is 0.5 nm or greater and 3 nm or smaller.

7. A gallium nitride-based compound semiconductor device according to claim 1, wherein

a thickness of the first GaN-based layer is 1500 nm or greater and 3000 nm or smaller;

a thickness of the n-type GaN-based layer is 1000 nm or greater and 2000 nm or smaller;

each of thicknesses of the AlGaN layer and the GaN layer in the first superlattice layer is 1.5 nm or greater and 5 nm or smaller;

a thickness of the second GaN-based layer is 20 nm or greater and 40 nm or smaller;

a thickness of the quantum well layer in the multiple quantum well layer is 1 nm or greater and 2 nm or smaller;

a thickness of the quantum barrier layer in the multiple quantum well layer is 6 nm or greater and 20 nm or smaller;

a thickness of the AlGaN layer in the second superlattice layer is 1 nm or greater and 6 nm or smaller;

a thickness of the GaN layer in the second superlattice layer is 0.5 nm or greater and 3 nm or smaller; and

a thickness of the p-type GaN-based layer is 10 nm or greater and 40 nm or smaller.

8. A method for manufacturing a gallium nitride-based compound-semiconductor device according to claim 1, wherein

the buffer layer is formed on the substrate at a temperature of 450° C. or higher and 600° C. or lower;

the first GaN-based layer, the n-type GaN-based layer, and the first superlattice layer are sequentially formed on the buffer layer at a temperature of 1050° C. or higher and 1100° C. or lower;

the second GaN-based layer and the multiple quantum well layer are sequentially formed on the first superlattice layer at a temperature of 800° C. or higher and 900° C. or lower; and

the second superlattice layer and the p-type GaN-based layer are sequentially formed on the multiple quantum well layer at a temperature of 950° C. or higher and 1025° C. or lower.

9. A gallium nitride-based compound semiconductor device according to claim 1, further comprising:

an n electrode which is connected to the n-type GaN-based layer;

a p electrode which is connected to the p-type GaN-based layer; and

a power supply which applies a voltage between the n electrode and the p electrode.

* * * * *

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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Application No. (if known): 10/516,703 Attorney Docket No.: 08228/061001

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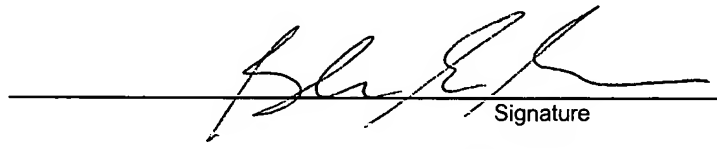
on June 5, 2008 .
Date



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CERTIFICATE OF CORRECTION

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APPLICATION NO.	:	10/516,703
ISSUE DATE	:	May 13, 2008
INVENTOR(S)	:	Hisao Sato et al.

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In the Claims:

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